

REMARKS

On pages 2 and 3 of the Office Action, the Examiner rejected claims 50-53, 58, and 59 under 35 U.S.C. §103(a) as being unpatentable over Chishti '511 in view of Chishti '893.

According to independent claim 50, the original positions of a patient's teeth are stored in memory, the desired final positions of the patient's teeth are stored in the memory, a finite element analysis is performed based on the orthodontic treatment and a movement of the patient's teeth between only the stored original and final positions, and a computer generated output that is based on the finite element analysis is provided.

Independent claim 50 is patentable over Chishti '511 in view of Chishti '893 for at least two reasons.

First, as the Examiner has recognized, Chishti '511 does not disclose or suggest performing a finite element analysis based on a movement of the patient's teeth between only stored original and final positions. Instead, Chishti '511 specifically discloses performing a finite element analysis based on the shape and material of each of a sequence of appliances to be applied to a patient.

Chishti '893 does not disclose performing a finite element analysis at all. Chishti '893 does disclose positioning a patient's teeth using a plurality of intermediate positions between original and final positions of a patient's teeth. Chishti '893 also discloses at column 5, lines 1-7 that, in those cases where a patients' teeth are responding very quickly, one or more intermediate appliances may be skipped so that the number of appliances is reduced below the number determined at the outset.

However, Chishti '893 does not disclose or suggest that the finite element analysis be rerun using the fewer intermediate appliances. Instead, Chishti '893 merely discloses that, if the treatment is progressing better than expected, one or more intermediate appliances be eliminated. At that point, however, the finite element analysis of Chishti '511 would have already been performed using all of the intermediate appliances that were initially contemplated.

Therefore, because neither Chishti '511 nor Chishti '893 discloses or suggests performing a finite element analysis based on a movement of the patient's teeth between only stored original and final positions,

neither Chishti '511 nor Chishti '893 discloses or suggests the invention of independent claim 50. Accordingly, for this first reason, independent claim 50 is patentable over Chishti '511 in view of Chishti '893.

Second, neither Chishti '511 nor Chishti '893 discloses or suggests the elimination of all intermediate appliances. Indeed, Chishti '893 specifically teaches that at least one intermediate appliance in addition to an initial appliance and a final appliance must be used. See Chishti '893, column 3, lines 31-45.

Therefore, Chishti '893 does not suggest eliminating all intermediate appliances and cannot, as a result, suggest performing the finite element analysis disclosed in Chishti '511 based on a movement of the patient's teeth between only original and final positions.

Accordingly, because neither Chishti '511 nor Chishti '893 discloses or suggests eliminating all intermediate appliances, neither Chishti '511 nor Chishti '893 discloses or suggests the invention of independent claim 50. Consequently, for this second reason, independent claim 50 is patentable over Chishti '511 in view of Chishti '893.

On page 6 of the Office Action, the Examiner argues that, although Chishti '893 does not teach eliminating all intermediate appliances, Chishti '893 does teach eliminating at least some intermediate appliances, which would suggest to one of ordinary skill that all intermediate appliances could be eliminated if the patient's teeth were moving sufficiently better than expected.

However, this argument is directly contrary to the teachings of Chishti '893 (see the Summary of the Invention section) which, as pointed out above, teaches the use of at least one intermediate appliance in the treatment of a patient's teeth.

Moreover, the Examiner's argument ignores the teaching of Chishti '511 that the finite element analysis has already been performed before any appliances have actually been used on the patient; there is no suggestion of rerunning the finite element analysis if no intermediate appliance is used because the patient's teeth are moving better than expected.

On page 2 of the Office Action, the Examiner argues that one of ordinary skill in the art would be motivated in view of Chishti '893 to eliminate all

intermediate positions in order to reduce costs. However, Chishti '893 does not suggest eliminating intermediate positions to save money. Chishti '893 merely suggests discarding certain intermediate appliances if the patient's teeth are moving better than expected. Moreover, as discussed above, Chishti '893 does not suggest eliminating all intermediate appliances.

The Examiner also asserts that the present application itself teaches the use of intermediate steps and that the present application, therefore, does not attach any criticality to the elimination of intermediate steps. However, it does not follow that a teaching of the use of intermediate appliances *per force* teaches that there is no criticality to the elimination of intermediate appliances. Moreover, these assertions are immaterial to the issue of whether the combination of Chishti '511 and Chishti '893 would have suggested the invention of independent claim 50 to one of ordinary skill in the art. Indeed, as shown above, the combination of Chishti '511 and Chishti '893 would not have suggested the invention of independent claim 50 to one of ordinary skill in the art.

Because the combination of Chishti '511 and Chishti '893 would not have suggested the invention of independent claim 50 to one of ordinary skill in the art, independent claim 50 is patentable over Chishti '511 in view of Chishti '893.

Because independent claim 50 is patentable over Chishti '511 in view of Chishti '893, dependent claims 51-53, 58, and 59 are likewise patentable over Chishti '511 in view of Chishti '893.

On page 3 of the Office Action, the Examiner rejected claims 54-57 under 35 U.S.C. §103(a) as being unpatentable over Chishti '511 in view of Chishti '893 and further in view of Chishti '310.

As pointed above, the combination of Chishti '511 and Chishti '893 would not have suggested the invention of independent claim 50 to one of ordinary skill in the art.

Chishti '310 discloses the use of intermediate positions and does not suggest performing a finite element analysis based on a movement of the patient's teeth between only original and final positions. Therefore, adding Chishti '310 to the combination of

Chishti '511 and Chishti '893 does not disclose or suggest the invention of independent claim 50.

Accordingly, because the combination of Chishti '511, Chishti '893, and Chishti '310 would not have suggested the invention of independent claim 50 to one of ordinary skill in the art, independent claim 50 is patentable over Chishti '511 in view of Chishti '893 and further in view of Chishti '310.

Because independent claim 50 is patentable over Chishti '511 in view of Chishti '893 and further in view of Chishti '310, dependent claims 54-57 likewise are patentable over Chishti '511 in view of Chishti '893 and further in view of Chishti '310.

On pages 3 and 4 of the Office Action, the Examiner rejected claims 60, 61, and 66-69 under 35 U.S.C. §103(a) as being unpatentable over Chishti '511.

Independent claim 60 recites that a finite element analysis is performed based on contact pairs between orthodontic appliances.

The Examiner recognizes that there is no disclosure in Chishti '511 of performing a finite element analysis based on contact pairs between orthodontic

appliances. Indeed, Chishti '511 does not disclose such contact pairs at all.

However, the Examiner argues that it is well known that forces are applied through contact points and that, therefore, any teaching of evaluating forces inherently suggests considering the areas where the forces are to be transferred. The Examiner then concludes that, because of this inherency, the invention of independent claim 60 would have been obvious.

Even if the Examiner's argument were true, the forces mentioned in Chishti '511 are between appliance and tooth and not between appliances. Indeed, Chishti '511 simply does not address forces between appliances and, therefore, cannot suggest performing a finite element analysis based on contact pairs between appliances.

Because Chishti '511 would not have suggested performing a finite element analysis based on contact pairs between appliances, independent claim 60 is patentable over Chishti '511.

Because independent claim 60 of the present application is patentable over Chishti '511, dependent

claims 61 and 66-69 are likewise patentable over Chishti '511.

On pages 4 and 5 of the Office Action, the Examiner rejected claims 62-65 under 35 U.S.C. §103(a) as being unpatentable over Chishti '511 in view of Chishti '310.

As pointed above, Chishti '511 would not have suggested to one of ordinary skill in the art the use in a finite element analysis based on the contact pairs recited in independent claim 60. Moreover, Chishti '310 also does not disclose or suggest this use of contact pairs. Therefore, adding Chishti '310 to Chishti '511 would not have suggested the invention of independent claim 60 to one of ordinary skill in the art.

Accordingly, independent claim 60 is patentable over Chishti '511 in view of Chishti '310.

Because independent claim 60 is patentable over Chishti '511 in view of Chishti '310, dependent claims 62-65 are likewise patentable over Chishti '511 in view of Chishti '310.

On page 5 of the Office Action, the Examiner rejected claims 70-102 under 35 U.S.C. §103(a) as being unpatentable over Chishti '511 in view of Chishti '310.

Independent claim 70 requires storing a proposed subset of orthodontic appliances from a set of pre-existing orthodontic appliances according to a proposed orthodontic treatment, performing a finite element analysis based on the proposed orthodontic treatment, storing a new subset of orthodontic appliances from the set of pre-existing orthodontic appliances if the finite element analysis indicates that the proposed orthodontic treatment produces undesired effects, and repeating the finite element analysis.

Chishti '511 does not disclose storing proposed subsets of orthodontic appliances from a set of pre-existing orthodontic appliances. Instead, Chishti '511 shows in Figure 2 that, if an aligner does not produce the desired result, a new aligner to be tested is calculated rather than retrieved from memory.

Accordingly, the Examiner relies on Chishti '310, citing paragraph 0141 in particular.

Chishti '310 shows a polymeric appliance in Figure 1C that is used to reposition a patient's teeth. Chishti '310 states that, in some cases, it may be necessary to model the aligner to accommodate an

attachment within a receptacle or aperture of the aligner.

To this end, paragraph 0141 of Chishti '310 states that conventional attachments are available in standard shapes and sizes, that these attachments can be selected from a library of virtual appliances, and that the aligners must be designed to accommodate the attachments when the attachments are needed.

As can be seen, Chishti '310 likewise does not disclose or suggest running the finite element analysis based on a stored a subset of appliances. Assuming that Chishti '511 and Chishti '310 can be combined at all, Chishti '511 and Chishti '310 would merely suggest using attachments from a library of attachments to help design an aligner and then testing the aligner using a finite element analysis. Thus, Chishti '511 and Chishti '310 at most suggest testing only the aligner that has been designed to accommodate the attachment and do not suggest testing the aligner with the attachment in place. Therefore, Chishti '511 and Chishti '310 do not suggest testing by use of a finite element analysis attachments stored from a set of pre-existing attachments.

Accordingly, a combination of Chishti '511 and Chishti '310 would not have suggested the invention of independent claim 70 to one of ordinary skill in the art.

Because Chishti '511 and Chishti '310 do not suggest the invention of independent claim 70, independent claim 70 is patentable over Chishti '511 in view of Chishti '310.

Independent claim 89 recites storing a set of orthodontic appliances, applying a subset of the stored set of orthodontic appliances to the patient's teeth according to one of first and second position models, and performing a finite element analysis based on the first position model, the second position model, and the applied subset of orthodontic appliances.

Chishti '511 does not disclose or suggest storing a set of aligners or testing a subset of stored aligners with a finite element analysis.

Chishti '310 discloses that attachments can be stored in a library but does not suggest testing these attachments with a finite element analysis. Chishti '310 instead only suggests designing aligners to accommodate attachments. Chishti '511 would then according to the Examiner's rationale test the aligner with a finite

element analysis. However, there is nothing to suggest that both the aligner with the attachment would be tested with the finite element analysis.

Because Chishti '511 and Chishti '310 do not suggest storing appliances in a memory and selecting a subset of the stored appliances for processing by a finite elements analysis, independent claim 89 of the present application is patentable over Chishti '511 in view of Chishti '310.

Because independent claims 70 and 89 are patentable over Chishti '511 in view of Chishti '310, dependent claims 71-88 and 90-102 are likewise patentable over Chishti '511 in view of Chishti '310.

Newly added independent claim 103 recites that a finite element analysis is performed based on contact pairs between orthodontic appliances and teeth to be applied during the orthodontic treatment.

The Examiner recognizes that there is no disclosure in Chishti '511 of performing a finite element analysis based on contact pairs between orthodontic appliances and teeth to be applied during the orthodontic treatment. Indeed, Chishti '511 does not disclose contact pairs at all.

However, the Examiner argues that it is well known that forces are applied through contact points and that, therefore, any teaching of evaluating forces inherently suggests considering the areas where the forces are to be transferred. The Examiner then concludes that, because of this inherency, the invention of independent claim 103 would have been obvious.

The Examiner's argument is not persuasive because, to be inherent, the use of contact pairs in a finite element analysis must be an inevitable consequence of using the finite element analysis. In other words, the finite element analysis could not be run without the use of contact pairs. However, the finite element analysis could be run using forces between appliance and tooth generally and not between specific points on the appliance and tooth, i.e., the contact pair.

Therefore, a premise of the Examiner's argument is not true making the Examiner's argument itself not true.

Because the Examiner's argument itself is not true, the Examiner has not established a prima facie case of obviousness of independent claim 103 over Chishti

'511. Therefore, independent claim 103 is patentable over Chishti '511.

Moreover, there is nothing in Chishti '511 that would suggest using the specific contact pairs between appliances and teeth instead of non-specific forces applied between appliances and teeth.

Because Chishti '511 does not suggest using the specific contact pairs between appliances and teeth instead of non-specific forces applied between appliances and teeth, independent claim 103 is patentable over Chishti '511.

Because independent claim 103 is patentable over Chishti '511, dependent claims 104-106 are patentable over Chishti '511.

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CONCLUSION

In view of the above, the claims of the present application patentably distinguish over the art applied by the Examiner. Accordingly, allowance of these claims and issuance of the present application are respectfully requested.

Respectfully submitted,

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